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$$6^{\lambda}\Sigma N(d)\cdot N\left(\frac{m}{d}\right) = N(m)\cdot N(Pm)\cdot N(P^2m),$$

where the sign of summation extends to all divisors of m.

188. Proposed by ELMER SCHUYLER, Brooklyn, New York.

Solve the congruence, $3x^2 + 4x + 5 \equiv 0$, mod. 20 [Reid].

189. Proposed by V. M. SPUNAR, Chicago, Ill.

If p and $p_1 = 2^p - 1$ are primes, then are the numbers of the sequence, $p_1 = 2^p - 1$, $p_2 = 2^{p_1} - 1$, $p_3 = 2^{p_2} - 1$, $\cdots$, $p_n = 2^{p_{n-1}} - 1$ all primes?

SOLUTIONS OF PROBLEMS.

ALGEBRA.

379. Proposed by C. N. SCHMALL, New York, N. Y.

Given $y = ax + b$. If the values of x increase in an arithmetical progression, show that the values of y vary likewise.

Solution by T. M. Blakslee, Ames, Iowa.

We have

$$y_1 = ax_1 + b,\quad y_2 = ax_2 + b,\quad y_3 = ax_3 + b,\ \cdots.$$

Hence,

$$y_2 - y_1 = a(x_2 - x_1),\quad y_3 - y_2 = a(x_3 - x_2),\ \cdots.$$

Since $x_1, x_2, x_3, \cdots, x_n$ are in an arithmetical progression,

$$x_2 - x_1 = x_3 - x_2 = x_4 - x_3,\ \cdots,\ = d \text{ say.}$$

Hence,

$$y_2 - y_1 = y_3 - y_2 = y_4 - y_3,\ \cdots,\ = ad.$$

Hence,

$$y_2 = y_1 + ad,\quad y_3 = y_2 + ad = y_1 + 2ad,$$

$$y_4 = y_3 + ad = y_1 + 3ad,\ \cdots,\ y_n = y_1 + (n-1)ad,$$

an arithmetical progression whose common difference is ad.

Also solved by A. H. Holmes, A. M. Hardin, Elmer Schuyler, W. T. Risley, T. J. Fitzpatrick, and the Proposer.

380. Proposed by J. K. ELWOOD, Lucas, Kansas.

A and B set out to walk around a cinder path a mile in circumference, and walk 3 hours, A walking 8 miles farther than B. Each reduced his rate one mile per hour at the end of the first hour, and again one mile per hour at the end of the second hour, his speed being otherwise uniform. They start in the same direction, but 12 minutes after A has passed B the third time he turns and walks in the other direction until 6 minutes after he has met B the third time, when he returns to his original direction, and overtakes B four times more. Determine their initial velocities.

Solution by the Proposer.

A gains $2\frac{2}{3}$ miles an hour, or one mile in 22.5 minutes. He overtakes and passes B the first three times in 67.5 minutes, and the last three times in 67.5 minutes. All of A's travel requiring calculation, therefore, occurs in

$$180 - (67.5 + 67.5) = 45 \text{ minutes of the second hour.}$$